Advanced processing and modeling methods for porous material FIB-SEM data

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Abstract

From natural sedimentary rocks to human engineered micro-filtration devices, microscale structures of porous material revealed by FIB-SEM tomography are of critical importance to many industrial sectors, oil & gas, construction, automotive filtration, and pharmaceutical, to name a few. The tremendous opportunity opened by FIB-SEM tomography comes with new challenges. In this presentation, we will focus on two of them that has broad impact.

Most of the time, it is very difficult or impossible to fill the pore space with epoxy before image acquisition, hence the electrons will go behind the current imaging plane and hit the back-side of the pore. The signal reflected from the pore-back created contrast artificially brighter than that of a pore space. Strategies on dealing with this “pore-back” artifact will be presented with applications in porous shale rock and fuel cells.

While FIB-SEM tomography provided unprecedented resolution, the volume of the specimen being studied is typically very small and unlikely to be representative. We will discuss how the microscale information from FIB-SEM can be integrated with macroscale data via a multi-scale imaging and modeling framework in subsurface transport applications.